CIRCULAR NO. 6165 AUGUST, 1929

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CONSUMPTION OF TIN IN THE UNITED STATES DURING 1928

BY

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CONSUMPTION OF TIN IN THE UNITED STATES DURING 1928[1]

By J. B. Umhau[2]

During 1928 the United States consumed 73,270 long tons of virgin or primary tin, which was approximately 7.5 per cent more than the 68,198 long tons consumed in 1927 and equaled 41 per cent of the world's production in 1928 (approximately 178,000 long tons). Consumers' stocks amounted to 9,268 tons on January 1, 1928, and 8,587 long tons on December 31, 1928, a net reduction of 681 tons. In addition to the virgin tin accounted for above, 12,106 long tons of secondary metallic tin were used by manufacturers of tin products in 1928. These figures are the result of an inquiry addressed by the Bureau of Mines to manufacturers to determine the amount of metallic tin used by them; in reply, 1,307 establishments reported consumption in 1928.

The distribution of the amount consumed by various uses, as shown in the following tabulation based on Bureau of Mines canvasses for 1927 and 1928 in comparison with consumption by uses reported by the War Industries Board for 1917, emphasizes the fact that new uses for tin have been developed in only minor or insignificant amounts. Furthermore, although the studies for recent years show that some older uses have been discontinued, the amounts involved were all small and insignificant. Variation in consumption from year to year parallels the fluctuations in demand for the already well-established tin products. For example, the manufacture of bearing metals and solders for motor cars and trucks[3] required 9,000 tons in 1928 compared to 16,000 tons in 1927; the canning industry continues to require the greater portion of the tin plate and also much solder. Growth in the electrical and the more recently developed industries (aeroplane, refrigerators, radio, etc.), while affecting total consumption of bearing metals, solders, etc., has made little change in the proportions required for these basic methods of using tin.

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[1] Common metals division, economics branch, Bureau of Mines.

[3] Facts and Figures of the Automobile Industry: National Automobile Chamber of Commerce, U. S. A., 1929 ed. p. 13, and 1928 ed., p. 83.

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Tin consumed within the great northeastern and north-central manufacturing belt of the United States amounted to 97 per cent of the total domestic consumption; New York, Pennsylvania, and Michigan, in this territory, consuming over 70 per cent of the total. It is within this industrial belt that 75 per cent of the total value of all the products of domestic industry is produced.

Of the 1,307 concerns reporting, only 175 noted the use of secondary tin as well as primary tin, and only about 250 individual concerns may be classed as consumers of more than 15 long tons or approximately one carload annually, of virgin tin. Of the balance about 150 individual concerns consume between 5 and 15 tons each during the year. The remainder, about two-thirds of the entire number, are small consumers. These 1,307 concerns include essentially all the initial ti fabricators through whose plants tin first enters into industrial uses in this country. The number does not include manufacturers who purchase alloys or other tin products for further fabrication.

Although this is the first time that an effort has been made to obtain da on consumers' stocks and separate figures on the use of secondary tin, this is th fourth time that the Government has canvassed concerns using tin in an effort to find out how much they use in their manufacturing processes. The first canvass made by the War Industries Board accounted for 76,257 long tons consumed during 1917 and included reclaimed or secondary tin not segregated from primary metal. summary of the statistical results of that study is appended hereto. The next canvass, made by the Bureau of Mines for 1925, accounted for the consumption of 117,406 long tons of tin and included primary and secondary tin. This amount is now conceded to be excessive by reason of inadvertent duplication. The subsequen studies by the Bureau of Mines account for 68,198 long tons of primary tin for 19 and for 73,270 long tons of primary tin and 12,106 long tons of secondary metalli tin for 1928.

Table 1.-- Tin used in the United States, 1927-1928

Uses	Primary				Secondary
	1927[1]		1928		1928
	Long tons	Per cent	Long tons	Per cent	Long to
Tin plate and terneplate	24,525.00	35.96	27,052.83	36.92	860
Solder	13,602.00	19.94	13,483.00	18.44	4,520
Babbitt	7,595.00	11.14	7,851.00	10.71	2,189
Bronze	4,663.90	6.85	4,296.00	5.86	1,112
Foil	4,193.38	6.15	5,068.25	6.92	---
Collapsible tubes	2,709.64	3.97	2,864.28	3.91	---
Chemicals	2,620.50	3.84	4,245.87	5.79	1,065
Tin oxide	1,311.17	1.93	1,183.30	1.61	---
Tinning, brass, copper tubes, sheets or shells, wire, nails, etc.	2,661.18	3.90	2,636.08	3.60	197
White metal	848.70	1.24	801.86	1.09	785
Type metal	450.00	.66	400.00	.54	878
Castings	1,011.00	1.48	730.41	.99	23
Other alloys	556.69	.81	628.65	.85	285
Miscellaneous	1,450.46	2.13	2,028.00	2.77	174
TOTAL	68,198.25	100.00	73,269.26	100.00	12,106

1 Revised figures.

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The consumption of primary tin for tin and terneplate manufacture repre-nts the principal single use for tin in this country, and in 1928 this use ac-unted for 27,053 long tons, or 37 per cent, of the total consumption as compared the 24,525 long tons, or 36 per cent, in 1927--a 10 per cent difference in vor of the 1928 figure. This increase is due primarily to general industrial pansion and to increased production of canned goods, requiring the greater por-on of the tin plate produced. The use of glass and paper for packing foods and usehold necessities is taking the place of much tin which would otherwise be ed in tin plate, and the attractiveness and utility of these containers are bound expand their popularity. Aluminum, which is durable and economical for cooking ensils, is also replacing much tin which would otherwise be used for tinplate re and for tinning and retinning such articles. Nonmetallic products, as well copper, zinc, and zinc-coated roofing have undoubtedly supplanted much tin and rneplate used for roofing, siding, etc. Effective economies in the amount of tin quired per base box of tin plate manufactured are also tending to reduce the tal consumption and to conserve the use of much metallic tin.

Solder, next in importance, required 13,483 long tons of tin, or 18.44 per nt of the total consumption in 1928. Compared with the 1927 figures, 13,602 ng tons and 19.94 per cent, there was a slight decrease. The growing practice "lap-welding" and die stamping tin cans has lessened the demand for solder in nning operations and consequently for much tin. The practice of "wiping" joints th solder by plumbers, now virtually abandoned on all new construction, has also fected a diminishing demand for solder and hence for tin. Moreover, cadmium is oving to be a satisfactory substitute for tin in some solders. "Amaloy", a cently introduced solder containing 98 per cent of lead and only 1 per cent or ss of tin, is also curtailing the use of tin in solder.

The manufacture of babbitt required 7,851 long tons or 10 per cent of the tal for 1928. This was approximately 4 per cent more than the 7,595 long tons nsumed in 1927 but was a slightly smaller percentage of the consumption of tin r all purposes. The consumption of tin in the manufacture of bronze decreased 8 r cent in 1928, the amounts consumed being 4,296 long tons, or 6 per cent of the tal, in 1928, and 4,663.90, or 7 per cent of the total, in 1927. Babbitt and onze bearings are now being replaced by roller and ball bearings.

Although the reported use of tin for tin foil and collapsible tubes was 933 long tons, or 10 per cent of the total tin consumption in 1928 and 6,903 ng tons in 1927, an apparent gain of 15 per cent in 1928, the 1928 figures in-lude data from three concerns whose operations in 1927 were not reported. Con-mption by the concerns reporting for both years shows a decline in this use of in. In the collapsible tube and foil industry aluminum has become a potent com-etitor of tin and it has been reported recently that nearly pure zinc, refined lectrolytically, shows pronounced ductility and has been used for making collap-ible tubes. A transparent cellulose product "cellophane," which may be had in arious colors for wrapping confections, etc., has recently appeared as a substi-ute for foil.

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There was a decided gain in the use of tin for the manufacture of chemical and oxide. Although rayon has taken the place of much silk, considerably more si is being worn. This is the primary reason for the great increase since 1917 in t use of tin for chemicals in the form of "bichloride", "tin salts", "tin-crystals" and "stannous chloride" in the silk industry. Tin oxide is largely used as a con stituent of the enamel applied to cooking utensils, refrigerators, and sanitary ware. Zirconium oxide, which is cheaper, is used instead of tin oxide by many manufacturers, and in many instances the mixture used is 6 parts tin oxide and 4 parts zirconium oxide. Japanning of the small cheaper articles, lacquer finishes on refrigerators, and the vitreous china used for sanitary ware instead of vitreo enamels are all factors which tend ultimately to replace considerable tin.

A use-trend picture may also be had by considering some of the 1917 and 1928 uses. In consumers' statements of tin used in bronze for sundry purposes in 1917, 15.45 long tons were reported by three manufacturers for bells, and the 192 reports from five manufacturers of bells showed the use of 16.26 tons. Included under white metal in 1928 are 263.78 long tons used for plated ware, Britannia wa etc., while in 1917 the use of tin on this account was 1,001.88 long tons, quite a decided decrease for the later date. In 1917 organ pipes required 24 long tons in 1928 this item required 21.4 tons. Tin pipe for soda and beer fountains, etc. required 252 long tons in 1917; for tinning carriage and harness hardware the re quirements were 102.36 long tons in 1917; and the requirements for the rubber in dustry in 1917 were 126 long tons. The 1928 requirements for these items were negligible and reported by only one or two manufacturers of each. It is interest ing to note that since 1917 there has been a decrease of approximately 45 per cen in the use of tin for the tinning of utensils for food preparation. In 1917 this item was 548.04 long tons and in 1928 only 311.69 long tons.

Included under "bronze" in 1928, but not reported separately by consumers heretofore and therefore not possible of comparison with previous years, are 7.3 long tons of tin used for making bronze powder. Likewise under "other alloys" are included 36.58 long tons of tin used in the manufacture of cable sheathing and 8.15 long tons in the manufacture of fusible plugs.

It is apparent that the greater portion of the tin reported as being used for "castings" is actually used as an ingredient of bronze or other alloy casting It is difficult to obtain satisfactory data from the consumers concerning this us of tin.

The item "other alloys" accounted for the use of 629 tons during 1928, in cluding tin used for organ pipes, cable sheathing, and fusible plugs mentioned above and that "not specified"; the consumers here account for the tin which they used in making specially designated alloys, such as dental metal, gunmetal, bolst metal, lead base phosphor, bullet metal, battery metal, needle metal, etc.

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The item "tinning" includes 115 long tons of tin used for covering copper wire. For other tinned wire and related tinning 983 tons of tin were used in 1928, 1,265 tons having been used in 1917. Other miscellaneous tinning, no item of which required over 60 tons, includes the tinning of bearings, tubes, and sheets, gray iron castings, rivets and pins, factory cans, retinning used cans, oil stove parts, steel barrels, harness hardware, hooks, and chain.

Approximately 10 per cent reported under the item "Miscellaneous" was tin which the consumers were unable to segregate according to uses. For example, concerns manufacturing a variety of commodities requiring tin are not always able to state just how much tin was used for each article, and have bracketed the items manufactured and reported only one consumption figure for all items. Included also under "Miscellaneous" are 133.38 long tons used for galvanizing compared to the 105.40 long tons used in 1917. Other miscellaneous articles for which tin is used were reported by only one or two concerns and therefore can not be disclosed. Among these there were the following, no one of which required any considerable amount:

Tinning mixture, tin bearings
Tin dust
Rubber industry
Lining soda-fountain tanks
Bars
Raw materials
Smokeless powder, caps, and fuse
Ball bearing parts
Wiring and stamping
Anodes
Bottle caps and sprinkler tops
Tin ribbon, tin tubing, tin bar
Valve seats
Torches
Calf muzzles
Pattern work
R. R. bond terminals
Trolley wheels, banjo rings, etc.
Wire
Hammers
Shelving
Terneplating conductor hooks
Building up piston heads
Metallic packing
Repair work
Elbows

SECONDARY OR RECLAIMED TIN USED

This survey is the first time that any effort has been made to ascertain quantitatively the various uses of secondary or reclaimed metallic tin. The recorded recovery of secondary tin as metallic tin shows approximately 9,000 short tons annually in the United States and 24,000 tons in tin alloys. Statistics are lacking to show to what extent this supply is augmented or decreased by imports and exports of secondary tin. The amount of all secondary metals recovered and used fluctuates with the price of the virgin metal. Cheaper virgin tin in 1928 probably resulted in less secondary tin being used that year than in the years of higher prices. Returns from 175 consumers indicate the domestic use of 12,106 long tons during 1928. The greatest single use of secondary tin is for solder, as 4,520 long tons of secondary metal were employed for this purpose in 1928. The secondary tin used for babbitt amounted to 2,189 long tons; for bronze, 1,112 long tons; for chemicals, 1,085 long tons; for type metal, 878 long tons; and for white metal, 735 long tons.

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STOCKS OF TIN IN THE HANDS OF THOSE USING TIN

Stocks of tin in domestic consumers' hands on January 1, 1928, were 9,268 long tons, and at the end of the year (December 31, 1928) the amount was 8,587 long tons, a net draft of 681 tons from stocks. Stocks were, however, very unevenly distributed. Many consumers held none, and some had very large stocks. Stocks cannot be apportioned with respect to the individual uses of tin. Tabulated below is the volume of tin used by manufacturers arranged in groups according to the predominant commodity made by them. The table also shows the stocks of tin in the hands of these groups at the beginning and end of 1928.

Table 2.-Tin stocks in hands of consumers manufacturing specified commodities, 1928 (Long tons)

Manufacturers of --	No. of manufacturers	Tin used			Stocks	
		Virgin	Secondary	Total	Jan. 1	Dec. 31
Tin and terneplate or tin and terne plate and other products	23	28,777.71	939.97	29,717.68	5,190.31	4,337.33
Solder or solder and other products	116	16,677.56	5,390.07	22,067.63	1,438.23	1,523.55
Babbitt or babbitt and other products	96	5,701.19	1,373.30	7,074.49	263.25	274.45
Bronze or bronze and other products	537	3,498.95	1,095.32	4,594.28	331.03	314.31
White metal, type metal, other alloys or white metal, type metal, other alloys, and other products	119	1,091.21	1,758.60	2,849.81	104.66	65.97
Castings or castings and other products	102	1,246.84	37.59	1,284.43	114.61	133.15
Foil or foil and other products	9	4,979.32	--	4,979.32	625.75	615.62
Tubes or tubes and other products	9	2,837.27	--	2,837.27	207.26	224.87
Tinned wares and other products	139	1,964.63	173.81	2,138.44	299.51	344.83
Chemicals and other products	15	5,413.18	1,085.52	6,498.70	474.51	574.65
Miscellaneous	142	1,081.40	251.92	1,333.31	163.04	135.32
For all purposes	1,307	73,269.26	12,106.10	85,375.36	9,215.16	8,533.75

The Bureau of Mines has received numerous requests for information regarding the industrial distribution of tin plate in the past. Therefore, the following tabulation is republished. It shows an estimate of the tin-plate requirements for 1918 based on war-time conditions as made by the War Industries Board. There is also republished the War Industries Board summary of uses of pig tin in 1917.

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Estimated Requirements Tin Plate, 1918

Required for	Per cent	Base boxes	Tons pig tin
Containers for Food and Edible Products			
Vegetables and fruit	22.0	7,893,755	7,104
Milk (condensed or evaporated)	13.0	4,763,029	4,287
Fish	5.5	1,960,339	1,764
Meat	4.5	1,632,938	1,469
Syrups and molasses	3.5	1,286,866	1,158
Butter, lard, and compounds	2.4	892,929	804
Baked beans	2.3	880,162	792
Soups	1.5	520,824	469
Baking powder	1.4	493,567	444
Crackers	1.3	476,608	428
Coffee, tea and substitutes	1.2	441,368	397
Miscl. food, (incl. fresh oysters, fresh crabmeat)	.8	309,810	279
Cocoa and spice	.8	306,454	276
Kraut	.8	291,164	262
Oils (olive, salad, cooking)	.7	245,745	221
Hominy	.3	103,876	93
Tomato pulp (5 gal.)	.3	94,683	85
Candy	.2	81,032	73
Spaghetti and macaroni	.1	35,463	32
Total	62.7	22,710,612	20,437
Tin-plate Products Used in Connection With Food or Food Containers			
Bottle and jar caps	1.8	664,839	598
Cooking utensils	1.4	524,031	472
Total	3.2	1,188,870	1,070
Containers for Products Other Than Edibles			
Oil and grease	7.0	2,562,793	2,306
Tobacco, cigars, cigarettes, and snuff	4.0	1,481,187	1,333
Paint and varnish	1.6	572,526	515
Pharmaceutical drugs	1.0	378,133	340
Polish (stove, shoe, and metal)	.7	240,818	216
Typewriter ribbons		15,717	14
Toilet articles (talcum, etc.)	.5	171,340	154
Total	14.9	5,422,614	4,878
Miscellaneous Uses, Tin Plate			
Export	16.5	6,000,000	5,400
War munitions, incl. (case linings, fuse boxes, shrapnel cases)	.8	292,578	263
Stove boards		8,000	7
Furnace pipe		6,400	6
Gas meters		35	
Total	17.3	6,307,013	5,676
Unclassified			
Caskets		4,500	4
Metal stamps		1,160	1
		724,950	653
Total	2.0	730,610	657
Grand total	100.0	36,359,719	32,718

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Use of Pig Tin (Including Recovered Tin) 1917 1/
In tons of 2,240 lbs.

Tin and terne plate	27,600.00
Solder	17,000.00
Babbitt	10,800.00
Brass and bronze 2/	4,815.48
Foil	4,000.00
Tubes (collapsible)	2,100.00
White metal 3/	2,765.88
Tinning 4/	2,511.48
Chemicals	608.04
Oxide	1,110.00
Miscellaneous 5/	2,946.16
Total	76,257.04

1/ Compiled by War Industries Board subcommittee on pig tin, 1918.
2/ Including 15.48 long tons used by three manufacturers of bells.
3/ Including plated ware, brittania ware.
4/ Including wire, utensils for food purposes, carriage and harness hardware.
5/ Including galvanizing, organ pipes, soda and beer fountains, etc., pipes; rubber, type metal, bullets, sundries by tin and terneplate plants, and that not specified.

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